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THE *TZUCHINOKO*, AN UNIDENTIFIED SNAKE FROM JAPAN

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ABSTRACT: A curiously short and squat snake has long been reported in the Japanese archipelago. Frequently said to occur in mountainous areas in the center of the archipelago, this reptile has been given as many as 40 different local names. We have retained here the name *tzuchinoko,* which is the most frequently used. Reported descriptions indicate that it is very probably a crotalid snake belonging either to the common species *Agkistrodon halys* (representing abnormal individuals, unusual behavior, or confused interpretations of observations), or to a yet unidentified species.

INTRODUCTION

The existence of a snake unknown to science has long been reported in Japan. A collection of Buddhistic spiritual tales from the end of the 13th century, and a large, 81-volume Sino-Japanese encyclopedia from the 17th–18th centuries, give the description of a snake known to be short (<1 m) and squat, living on some of the islands of the Japanese archipelago. More recently, its presence has been reported by natives in Korea and New Guinea to Japanese people living in those countries. It may have been eaten by Japanese soldiers in New Guinea during World War II (Yamamoto 1973, 1985).

Among some 40 names used by the Japanese to designate this animal (Yamamoto 1973), we have retained *tzuchinoko,* the most frequently used name. The *tzuchi* is a kind of straw bat whose form is reminiscent of that flying mammal; *tzuchinoko* literally means "the child (or the son) of the straw bat." Most of the other names (such as "rolling-hammer," "snake-bat," "horizontal bat") evoke its characteristic silhouette: a triangular and well-defined head, and a large, squat body with subparallel sides, tapering off abruptly into a thin, short tail which forms the "handle" of the *tzuchi.*

Reported throughout the principal island of Honshu (although less often in the north), as well as the islands of Kyushu and Shikoku, it seems to be absent from the island of Hokkaido and from the small Ryu-kyu and Amami islands (Yamamoto 1973). The more frequent encounters, and also the more recent ones (Yamamoto 1985), have taken place in mountainous regions in the center of the islands. It is not an animal confined to high altitudes; on the contrary, it is most common at lower and middle elevations.

The following reports and descriptions are taken essentially from Yamamoto's works (1973, 1985), and from his letter to us of October 7, 1985. Newspaper articles have also noted the *tzuchinoko* (the weekly *Yomiuri* of June 30, 1973, for example), as has the Japanese *Encyclopedia of the Animals*

of the World (Tajima 1973), and a number of general publications ("Reptiles and Batrachians," in *Illustrated Animals*, Gakken, ed.). The *tzuchinoko* has also attracted the attention of Japanese zoologists, whose opinions about it were summarized by Tajima (1973).

Some Eyewitness Reports

Before giving a description of the animal, and discussing its possible systematic position, we think it would be useful to discuss some of the reports, taken from Yamamoto (1973, 1985, and personal communication).

- M. Kyuzo, a mountain dweller living near Hashimoto (a little town south of Osaka), encountered it 30 years ago. On that day, he was working in his field located at the foot of a hill, which was covered with a pine forest and dwarf bamboos. He suddenly heard a loud noise coming down from the hill, and then saw a rolling round and black object, rather similar to a tire of a scooter. The object finished its course without ever rebounding, and disappeared into an irrigation canal, which was dry in that season. Intrigued, Kyuzo went over to the canal. He arrived just in time to see the object unroll, stretch out like a stick, and make a vertical leap and disappear.
- M. Kanelo has seen a *tzuchinoko* three times since 1943, all at the same place (Honshu, right bank of the Hayadashidani, ridge of Mount Bishamon, 973 meters in altitude). He compared it to a weaving loom shuttle, and reported that it descended the wooden slope by rolling. He is one of the few witnesses who consider this animal to be "gentle," and not likely to bite people. The majority of the other witnesses consider the *tzuchinoko* to be aggressive, and they think that its bite is very dangerous, indeed deadly.
- The Tsujimoto couple encountered the reptile near Tojikimi (a mountain village southeast of Osaka) in 1970. Stopping to rest, they sat on a tree stump near what they thought was a broken-off branch. They had scarcely sat down when they saw the "branch" move, and they then realized that it was an extremely thick but short snake. It ascended the path at considerable speed, twisting from the left to the right. They reported a large size, a short tail, and the presence of big, brown-colored scales, marked with dull spots "like those of a boa." They also noted that the body did not seem to represent a circular section, but rather triangular.
- During World War II, M. Foujiwara saw a captive *tzuchinoko* in the region of Tamba, north of Kyoto. The animal had been put in a big cask, in which it lay coiled up in a half circle. Its body thickness was said to be remarkable.
- M. Tokutake, a farmer in the mountainous region in the center of Honshu, is also occasionally a hunter of *mamushi,* Halys vipers (*Agkistrodon halys*). He differentiates between the *mamushi* and the *tzuchinoko,* which he claims to have caught twice. The first time, at the end of June, 1969, he

encountered the animal in a grove, between a field and a swamp. He could immediately tell it was not a *mamushi,* he said, because of its squat body, the width of its mouth, and the dimension of the spots on its back. When he approached it, the *tzuchinoko* raised its head, showed its "teeth," and moved its tongue. The animal then reportedly made a leap in the direction of Tokutake, who was able to avoid it. The snake fell in the stubble, nearly 3 meters away. Accustomed to catching snakes, Tokutake captured it with the help of his *sassumata* (a kind of forked stick used by snake hunters). After keeping it captive for some days, Tokutake reportedly killed, grilled, and ate it. It was on the occasion of this "dissection" that our gastronome stated that the tail did not contain vertebrae, and that he found three small half-digested rabbits in the alimentary canal. The specimen measured 54 cm in length, 5 cm in diameter, and had seven dull spots along its back. Tokutake found its flesh more fatty than that of the *mamushi* he was accustomed to.

The second capture took place on August 1, 1971, some 10 km farther north. On that occasion, the *tzuchinoko* was swimming in a spring. Although it again showed aggressiveness, Tokutake tried to capture it. He stated that the skin formed a fold just above the eyes, which were "blinking"; it had what looked like "ears." The animal was "groaning" like a rat, erecting its "ears." Tokutake attributed this behavior to its state of arousal.

- M. Kawano is said to have taken some photos in Yoshino (east of Osaka) in 1968. Unfortunately, he lost the negatives before they could be developed. That same year, in the same region, a *tzuchinoko* was reportedly crushed by a bulldozer, and in 1938, a small girl reportedly brought one to her mother. It had been found dead at the foot of a peach tree; the animal measured 40 cm, had a diameter of a beer bottle (7 to 8 cm), and weighed 3–4 kg.
- More recently, in 1977, three alpinists reportedly observed one at an elevation of 2,200 meters in a swamp forest of the Aka-ishi mountain range (at Honshu, between Nagoya and Tokyo).
- Finally, we wish to point out that Bernard Heuvelmans has recently sent to us a photocopy of a newspaper article showing a photo of an alleged *tzuchinoko* skeleton of about 50 cm, the property of a certain M. Watanabe Masao. Despite bad reproductive quality, it is quite evident that it is a snake skeleton, undoubtedly that of a crotalid. The newspaper in which the photo was published, and Watanabe's address, are unfortunately not known to us at this time.

DESCRIPTION

Morphology.—The body length varies between 30 and 80 cm, and the width between 7 and 8 cm. The triangular head is distinctly separated from the body by a narrow neck, and is covered by a "rigid skin" (like that of a

crocodile, according to some eyewitnesses) composed of very large scales The eyes are remarkably big, and movable "eyelids" are said to protec them. Two distinct dimples lie between the nostrils and the eyes (whic make one think of the crotalid's thermoreceptive pit organs). The red tongu is reportedly not bifid.

The body has subparallel sides, and a triangular section. It displays larg scales, and bears a distinctly doubled mid-dorsal crest. The literal translatio of some eyewitnesses' reports (and also of the known consumer, Tokutake speaks of a "double spinal column." This surprising fact was recently con firmed by Yamamoto (personal communication, October 7, 1985). The pos terior part of the body narrows abruptly to end in a small, slender tai representing less than 15 percent of the animal's total length. Artist's ren ditions of the *tzuchinoko* based on many reported eyewitness description appear in Fig. 1

The coloration in the dorsal area varies from black to darkened red-brow to iridescent grey (the *tzuchinoko* has the reputation of changing its color Ten or fewer darker spots are arranged along the body. Ventrally, the vente is a yellowish orange-red, and is covered with large scales, which can b erected. Between the mouth and the eyes there is often reported a wel marked dull band. The ribs are widely separated; there are neither ribs no vertebrae in the tail. Erectile "ears" are sometimes reported to point outwar (probably marking the beginning of moulting).

Finally, many witnesses attribute a disagreeable odor, like that from chestnut tree flower, to the *tzuchinoko.*

Ecology and behavior.—The *tzuchinoko* is generally reported in stubb fields, hillside bushes, wet forests, and hillside swamps. Its altitudinal rang is between 1,000 and 2,000 meters. Movement on the ground is by rectilinea locomotion; because of its large ventral scales, it can progress forward in straight line, without meandering, as many large vipers do (*Bitis,* for ex ample). It swims well, and is able to cross streams. Many people claim th it is able to hang from tree branches by its tail. A very curious way of movin has often been reported: the animal rolls itself into a ball or hoop (as d scaly anteaters and armadillos) and rolls down hills.

The vast majority of Japanese people regard it as being aggressive an venomous. It is believed to stand up erect on its tail before attacking. Othe claim that it is able to spit its venom at a distance, cobra-like. It is reporte to be very noisy—it "whistles," "hoots," "snores," or "moans" like a rat

It has been more frequently sighted in fair weather season (from April October), and when it is overcast ("favorable days to go fishing," accordin to many reports). It reportedly feeds on small mammals (Yamamoto 1973 No shed skins have ever been reported, and nothing is known about i reproductive biology. Yamamoto (personal communication, October 7, 198

FIG. 1.—Artist's renditions of the *Izuchinoko*, a Japanese snake reported to be different from Halys viper. Based on many eyewitness descriptions.

explains an observation of two individuals "rolled up" as coupling. Th more likely would have been two males fighting, perhaps two Halys viper *Agkistrodon halys* (Petzold 1974). At rest, the *tzuchinoko* has sometim been reported coiled-up on itself, in a half or full circle.

Discussion

Most Japanese herpetologists do not accept the existence of this suppos reptile, thinking that observations of *Agkistrodon halys* digesting its pr have been falsely interpreted. Sato and Maki especially hold this view (Ma 1931). Others, on the other hand, suggest that *tzuchinoko* reports may conta elements of truth, as it is doubtful that mountain dwellers would syster atically confuse it with the Halys viper, and the cultural recognition *tzuchinoko* has a long history and is widely distributed.

This is far from being an exhaustive literature review of Japanese reptile Gans (1949) did an excellent review of the topic. However, from the repor obtained by Yamamoto (1973, 1985), articles by Tajima (1973), and son basic works (Maki 1931, Angel 1950, Grassé 1970, Nakamura and Uer 1972, Petzold 1974), it is possible to reach some conclusions, followi Ueno, curator at the National Museum of Natural History, in Tokyo (Tajin 1973). The characteristics discussed above can be divided into two cat gories:

1. *Myths, exaggerations, and false interpretations.* The loop position, t presence of "ears," a prehensile tail, and the spitting of venom, could based on widespread myths (milker snakes, spitting fire, or poisoned breath attributing to the *tzuchinoko* the characteristics of other species (the veno spitting of the cobras and other *Bitis* or *Crotalus*), or on false interpretatio of actual observations (the first stages of moulting, for example, give ma snakes the appearance of having ears). The fabulous leaps made by t *tzuchinoko* are certainly exaggerated in terms of height, but a common Mor pelier snake is able to jump many meters down a slope. A prehensile ta could well exist in the *tzuchinoko,* as it does in certain other snakes (*Bothrop* for example). The "double spinal column" may be explained by the presen of a special coloration (*Bitis gabonica,* for example) or carinated scales (in *Lachesis mutus* or several *Bitis* spp., for example).

2. *Ophidian traits.* Most of the reported traits resemble those of a snak more precisely a member of the Crotalidae. These are:

—Facial pits (thermoreceptive organs), characteristic of the Crotalidae onl
—Absence of vertebrae in the tail; fusion of the last vertebrae in a style "terminal body" (Zimmerman and Pope 1948, Angel 1950, Guibe Grassé 1970).
—A small slender tail which the animal shakes as a warning (Yamamo 1973, 1985), like in crotalids, but which is noiseless, as in the speci

of the primitive Japanese genera *Agkistrodon* and *Trimeresurus* (Nakamura and Ueno 1972).

—The large cephalic scales, also observed in primitive crotalids such as *Agkistrodon* and *Trimeresurus* (Petzhold 1974).

—The diet (small mammals), the rest position (flat spiral), the attack position (S form), and the probable existence of male combat apply to many snakes. The mobile "eyelids" are doubtless nothing more than scales forming folds above the eyes, a very common feature of the Viperidae and Crotalidae (for example, in *Pseudocerastes cornutus,* from Baluchistan, and the southeast Asian *Trimeresurus cornutus*). Finally, all snakes have a bifid tongue, but in some, the base of the tongue is highly colored, while the bifid extremity is less noticeable (as in *Bitis gabonica,* for example).

Other traits, however, recall the Viperidae s.str., especially certain species of *Bitis* (Angel 1950, Petzold 1974):

—Short, squat body, wide head, and well-marked neck (*Bitis* spp., but also *Bothrops alternatus*).

—Triangular section of the body (very conspicuous in *Bitis gabonica,* for example).

—Rectilinear locomotion, without meandering; mostly characteristic of the Viperidae with thicker bodies (*Bitis* spp.), which possess very large ventral scales. Further, these snakes swell their bodies and flatten dorsoventrally when they are aroused (as reported with the *tzuchinoko*).

—Size of the dorsal scales, undoubtedly exaggerated, but, again, many species of *Bitis* (*gabonica, arietans, nasicornis*) have remarkably large dorsal scales for snakes of their relatively modest size.

—Raised scales above the eyes, which is observed in *Bitis nasicornis* (Africa), *Pseudocerastes persicus* (Baluchistan), *Cerastes cerastes* (North Africa and Southwest Asia), *Trimeresurus cornutus* (Southeast Asia), and others.

Finally, the noisy nature of the *tzuchinoko* is not surprising. Although "mute," many snakes nonetheless make some sounds. *Bitis arietans* has a powerful and extended breath, which has given it the nickname of puff adder; *Elaphe taeniura,* the Indochinese and Japanese grass snake, "screams" and "mews" like a cat, and *Vipera russelli* (south and southeast Asia) has a very powerful "whistle" (Angel 1950, Petzold 1974).

Conclusions

Descriptions of the *tzuchinoko* suggest two possibilities, the first being misinterpreted observations of *Agkistrodon halys,* such as individuals swallowing or digesting their prey, abnormal individuals (teratologies?), or in-

dividuals behaving atypically. In the case of such a variable species as *halys,* this hypothesis cannot be rejected, particularly since the *tzuchino* clearly shows common traits with the *mamushi* (*A. halys*), such as si marked commissure between the mouth and the eyes, and cryptic colorati and habitat.

Agkistrodon halys is indeed a widespread and very polymorphic speci It is a crepuscular animal, encountered at middle and high altitudes (up 3,200 meters in the Kirghiz mountain range), but it is found usually mountain forests where its brown-red cryptic coloration provides good ca ouflage among dead leaves. The back has large, black circular marks (ge erally 18 to 22, aligned two by two), the neck is well marked, and on t large head, like with most of the primitive members of the Crotalidae, the are large cephalic scales (Maki 1931, Nakamura and Ueno 1972, Petzo 1974).

However, we cannot discard the second possibility; that is, the hypothe that the *tzuchinoko* may be a new species of *Agkistrodon.* Its striking mo phology, the historical span (reported since the 13th century), and the co sistency of reports—most of them coming from mountain dwellers w distinguish between the *tzuchinoko* and the *mamushi* (*A. halys*)—argue favor of this hypothesis. We should also point out that the Japanese co monly are able to distinguish among the five species and subspecies crotalids living in their archipelago, namely *Agkistrodon halys* (*mamush Trimeresurus okinavensis* (*himehabu*), *T. elegans* (*sakishimahabu*), *T. fl voviridis tokarensis* (*tokarahabu*) and *T. flavoviridis flavoviridis* (*habu*). (Speci of the genus *Trimeresurus* are restricted to the small Ryu-kyu and Ama islands.)

Finally, some *tzuchinoko* traits (body size, scales, triangular section, ma ner of locomotion) suggest a convergence with certain African Viperid (*Bitis* spp., for example).

Even in a country as well studied as Japan, the vertebrate fauna can st hold some surprises. In this century, Maki (1930), Okada (1936, 195 Malnate and Munsterman (1960), Gloyd (1955), and others have discover and described new varieties, subspecies, and species of reptiles.

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